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EXAMINER

WERNER, DAVID N

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/726,521	Applicant(s) LEE, YOUNG-HO	
	Examiner David N. Werner	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-8 and 10 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8 and 10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This Office action for US Patent Application 10/726,521 is in response to communications filed 19 September 2007, in reply to the non-final rejection of 19 June 2007. Currently, claims 1, 3-8, and 10 are pending. Claims 2 and 9 have been canceled.

2. In the previous Office action, claim 8 was rejected under 35 U.S.C. 102(b) as anticipated by US Patent 6,285,711 B1 (Ratakonda et al.), claim 1 was rejected under 35 U.S.C. 103(a) as obvious over Ratakonda et al., claims 2, 5, 9, and 10 were rejected under 35 U.S.C. 103(a) as obvious over Ratakonda et al. in view of "Efficient Block Motion Estimation Using Integral Projection" (Sauer et al.), and claims 3, 4, 6, and 7 were rejected under 35 U.S.C. 103(a) as obvious over Ratakonda et al. in view of Sauer et al., and in view of US Patent 6,128,047 A (Chang et al.).

Response to Arguments

3. Applicant's arguments filed 19 September 2007 have been fully considered but they are not persuasive. Applicant argues that since Ratakonda does not teach a true "integral projection matching method" in which one search area is used to estimate both the vertical and horizontal components of a motion vector, but rather, a "quasi-projection matching method" in which motion components are estimated with different search areas, it is improper to combine Ratakonda with Sauer et al., which teaches a conventional integral projection method.

The Examiner respectfully disagrees with this assertion. While it is noted that Ratakonda does not teach pure "integral projection", but rather an improved version, a combination of a base element and an improvement thereof does not necessarily improperly "teach away" from the improvement. While it is recognized that a prior art reference that teaches away from the claimed invention is a significant factor to be considered in determining obviousness (MPEP § 2145), and that only the Ratakonda reference teaches the claimed feature of "determining reference positions of the second frame which is shifted according to the vertical motion vector, when calculating horizontal motion vectors of the second frame", it is important to consider that an obviousness rejection is based on a combination of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Therefore, a rejection based on a combination of references is not based on each individual reference, separately and as a whole, nor that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the present invention, as admitted by the Applicant, Ratakonda recognizes the advantage of calculating components of a motion vector with different search areas (Applicant's remarks, page 7), rather than using the same search area, as taught by the conventional integral projection technique.

The test, then, for whether a reference teaches away from the claimed invention is not a mere difference in one or more aspects between the claimed invention and the

reference, but instead, whether "a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant". See *In re Gurley*, 27 F.3d 551, 553; 31 USPQ2d 1130, 1131 (Fed. Cir. 1994). In the present application, this does not appear to be the case; indeed, the present invention appears to solve the common problem of increasing speed of motion vector calculation, stated in paragraph 0014 of the specification of the instant application, and column 2: line 66 of Ratakonda, in a substantially similar manner, as will be explained below. In conclusion, the Examiner respectfully maintains that a person having ordinary skill in the art would be suggested or motivated to combine a conventional Integral Projection motion vector determination system with an improved motion vector determination system in which one motion component is determined based on an offset target area determined from a second motion component, as taught by Ratakonda. Therefore, the rejections under 35 U.S.C. 103(a) based on the combination of Sauer et al. and Ratakonda are maintained.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 5, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Efficient Block Motion Estimation Using Integral Projection" (Sauer

et al.) in view of US Patent 6,285,711 B1 (Ratakonda et al.). Sauer et al. teaches a motion estimation method. Regarding claims 1 and 8, Sauer et al. calculates an "estimated vertical and horizontal displacement" between a previous frame and a current frame (§ II.A). This corresponds with the claimed "vertical motion vector calculation" and "horizontal motion vector calculation". In Sauer et al., a vertical projection vector is formed, with each entry formed from summing the pixels in a row in a search area (Equation 1). This corresponds with the claimed "adding values of pixels of each of horizontal lines forming the first frame to calculate vertical sums". Each entry $p_v(m;i)$ in the vertical projection vector is individually used in further calculations (Equation 2). This corresponds with the claimed "storing the vertical sums by horizontal line". A similar process is performed for a horizontal projection vector (§ II.A). This corresponds with the claimed "calculating differences between the vertical sums of the first frame and vertical sums of the second frame". The vertical and horizontal projection vectors are then used in a Mean Absolute Error calculation to find motion vector (\hat{a}, \hat{b}) (equation 2). This corresponds with the claimed "processing the differences into absolute values to calculate sums of absolute value differences".

However, as argued by the Applicant, Sauer et al. does not teach determining a vertical offset determined from vertical motion vectors for use in horizontal motion calculation.

Ratakonda et al. teaches a modified, or "quasi", integral projection system. Rather than obtaining both the horizontal and vertical components of a motion vector using one search area, as in Sauer et al., in Ratakonda et al., a first motion vector

component is estimated, then the search area is displaced according to the first motion vector component (column 6: lines 18-23). In the example shown in figure 2, the vertical motion is first estimated from row average vectors, and the search area is vertically displaced according to this vertical motion (column 6: lines 24-33). This corresponds with the claimed "shifting the second frame according to the vertical motion vector". The horizontal motion is then estimated from column average vectors according to the displaced search area determined from the estimated vertical motion (column 6: lines 33-37). This corresponds with the claimed "calculating horizontal motion vectors" according to the "decided vertical reference positions".

Sauer et al. discloses the claimed invention except for determining a horizontal motion vector according to a shifted position determined by a vertical motion vector. Ratakonda et al. teaches that it was known to shift the search area for horizontal motion vectors according to vertical motion. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made, to incorporate the vertical displacement of Ratakonda et al. into the integral projection of Sauer et al., since as admitted by the Applicant, Ratakonda et al. states in column 6: lines 14-16 that such a modification produces greater accuracy than conventional integral projection.

Regarding claims 5 and 10, in Sauer et al, the horizontal projection vector is used in a similar manner to the vertical projection vector described above to determine the horizontal component of motion vector (\hat{a}, \hat{b}) (§ II.A), and in Ratakonda et al., the horizontal motion is determined from displacement according to vertical motion (column 6: lines 31-37).

6. Claims 3, 4, 6, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sauer et al. in view of Ratakonda as applied to claim 1 above, and further in view of US Patent 6,128,047 (Chang et al.). Sauer et al. discloses a MAE criterion in which the least of the sum of absolute differences of candidate values is chosen as a motion vector component, but it does not disclose an adder component or selection component for performing this calculation.

Chang et al. discloses a system for determining motion vectors between two video frames with integral projection. Regarding claims 3 and 6, figure 12 shows a processor in an embodiment of Chang et al. This processor contains processor element array 1220, which comprises an array of processor elements 1225, which include subtraction and adder units for SAD calculation (column 14: lines 6-13). Regarding claim 4, searching for the x-coordinate of a motion vector is performed from vertical projections (column 10: lines 34-37). The current block is compared to a series of candidate blocks to find the best match. If the difference between a candidate block is less than that for all previously searched candidate blocks, the current candidate block is considered the "best" block (column 10: lines 17-20). This difference is calculated according to the Sum of the Absolute Differences between the vertical projection of the current block and the vertical projection of the candidate block, over the search range (column 10: lines 39-50). Regarding claim 7, similarly, the best-match block in the vertical direction is calculated according to the minimized Sum of Absolute

Differences between the horizontal projection of the current block and the candidate block (column 11: line 41–column 12: line 34).

Sauer et al., in combination with Ratakonda et al., discloses the claimed invention except for details of SAD calculation. Chang et al. teaches that it was known to determine the best-match block to a current block between frames by minimizing SAD values, determined with adder units, according to integral projection. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to search for matching blocks from minimized SAD values from integral projection as taught by Chang et al., since Chang et al. states in column 2: line 49 that such a technique is faster and uses less computations than traditional "full-search" block matching.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent Application Publication 2001/0008548 A1 (Takeda et al.) teaches a two-step motion vector search system that determines a primary motion vector and a "secondary motion vector" used to correct error in determining the primary motion vector.

8. Although there are no new grounds of rejection, this action is non-final, due to a new interpretation of the cited references.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to David N. Werner whose telephone number is (571) 272-9662. The examiner can normally be reached on Monday-Friday from 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571) 272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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